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REPORT

OF THE

Board of Public Improvements

ON PROPOSED

EXTENSION

OF THE

ST. LOUIS WATER WORKS.

ST. LOUIS, JULY, 1885.

Charles McRitchie Esq
Compt'l of
Thos J. Whitman

BOARD OF PUBLIC IMPROVEMENTS.

CHARLES McRITCHIE	PRESIDENT
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EMORY S. FOSTER,	SECRETARY

EXTENSION OF ST. LOUIS WATERWORKS.

To the Honorable Mayor and Municipal Assembly of the City of St. Louis:

GENTLEMEN.—The Board of Public Improvements begs leave to submit herewith its report, estimates and plans for the extension of the low-service division of the St. Louis Waterworks.

The proposed extension contemplates the erection of works of a capacity of fifty million gallons per day at first, with provision made so that this can be increased to an ultimate capacity of one hundred millions of United States gallons per day, by adding pumping machines, settling basins and filters as they may be required.

The location of the new low-service works recommended by the Board of Public Improvements is near the Chain of Rocks, about seven and a half miles above Bissell's Point. The reasons for taking the water from the river at the Chain of Rocks have been so fully stated in various reports to the city authorities (and more particularly in the reports of the Board of Public Improvements submitted during the last five years), that it will be sufficient to give a short resumé, in the latter part of this report, of the grounds on which the Board's recommendation is based.

No serious argument has ever been advanced against the location at the Chain of Rocks except the presumed greater cost of the works, if erected at that locality, over works of the same capacity erected at Bissell's Point.

To ascertain whether this objection is well founded, plans and estimates have been made for both locations. Each plan contemplates the erection of a tower in the river for receiving the water, a conduit from this tower to the pump pits, the foundations for the pumping machinery, the erection of engine-house, boiler-house, and a house for storage of coal, and a set of low-service pumping engines; the construction of settling basins and of filter beds.

As far as the items here mentioned are concerned, the requirements are exactly alike, and the difference in cost arises from the natural conditions prevailing in the two locations.

But in addition to these works, common to both plans, the location at the Chain of Rocks requires the construction of a large conduit, seven and a-half miles in length, to convey the water from the settling basins at the Chain of Rocks to the clear well, and eventually to the filter beds at Bissell's Point; it also demands the construction of a switch track for conveying coal to the low-service works.

These two items largely increase the cost of works at this location, but the natural advantages of the ground at the Chain, as regards con-

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struction of foundation and the difference in the cost of land required for settling basins and filter beds, are, as the estimate shows, sufficient to balance the cost of conduit and railroad switch, not only for the ultimate extension of the Works to a capacity of 100,000,000 gallons per day, but even for the first extension to a capacity of 50,000,000 gallons per day.

Estimate of Cost of Low-Service Works—Capacity 50,000,000 Gallons per Day. "A," Chain of Rocks.

DIVISION No. 1,

EMBRACING THE CONSTRUCTION OF THE RIVER WORK.

River Tower erected complete in place.....	\$ 25,000
2,000 lineal feet conduit, connecting River Tower with Engine pits, \$25.....	50,000
9,500 cubic yards stone masonry in pump pits and engine and building foundations, at average price, \$14.50.....	137,750
9,000 cubic yards of rock excavation, \$1.00.....	9,000
11,000 cubic yards of earth excavation, 50 cents.....	5,500
58,000 cubic yards of earth embankment, 25 cents.....	14,500
4,000 lineal feet of railroad switch, \$2.00.....	8,000
Engine, Boiler and Coal Houses and Chimney Stack.....	70,000
Construction and erection of three Pumping Engines, with boilers and all appurtenances complete, each engine capable of pumping twenty-five million gallons per twenty-four hours, \$85,000.....	255,000
150 tons of 48-inch pipe at \$35.00.....	5,250
Total	\$ 580,000

DIVISION No. 2.

Embraces the construction of three settling basins of a capacity of thirty-five million gallons each, with distribution well, conduits, etc.

137,000 cubic yards earth excavation, 21 cents.....	\$ 28,770
51,000 cubic yards clay puddle, 55 cents.....	28,050
525 cubic yards sand filling, \$2.00.....	1,050
23,000 cubic yards concrete masonry, \$4.60.....	105,800
31,000 cubic yards stone masonry, \$6.50.....	201,500
1,600 cubic yards cut stone masonry, \$25.00.....	40,000
500 cubic yards brick masonry, \$8.00	40,000
80,000 square yards brick paving, 90 cents.....	72,000
4,500 square yards stone paving, \$1.50.....	6,750
Gate houses, gates and appurtenances.....	11,250
Total	\$ 535,170

DIVISION No. 3.

Embracing the construction of a conduit for conveying the water from the settling basins at Chain to filter-beds at Bissell's Point, and building the railroad switch connecting the Wabash track with the low-service pumping station at the Chain.

295,000 cubic yards earth excavation, 25 cents.....	\$ 73,750
1,000 cubic yards puddle, 60 cents	600
80,500 cubic yards concrete masonry, \$4.85.....	390,425
27,500 cubic yards brick masonry, \$8.00.....	220,000
1,600 cubic yards rubble stone masonry, \$5.50	8,800
500 cubic yards coursed rubble stone masonry, \$8.00.....	4,000
100 cubic yards cut stone masonry, \$25.00.....	2,500
150 piles in foundations across creeks, \$15.00.....	2,250
15,000 feet B. M. timber in foundations across creeks, \$35 per M.....	525
23,000 lineal feet of railroad track, connecting Wabash track with pumping station, \$2.00.....	46,000
Gates, gate houses and appurtenances.....	7,500
Total.....	\$ 756,350

DIVISION No. 4.

Alterations of present settling basins into four filter beds at \$162,500	\$ 650,000
Constructing one additional filter bed.....	250,000
Total	\$ 900,000

DIVISION No. 5.

Land Damages.....	\$ 65,000
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RECAPITULATION.

Division No. 1, RIVER WORK	\$ 580,000
Division No. 2, SETTLING BASINS	535,170
Division No. 3, CONDUIT.....	756,350
Division No. 4, FILTER BEDS.....	900,000
Division No. 5, LAND DAMAGES.....	65,000
Total	\$ 2,836,520

“B,” Estimate for Extension of the Low-Service Works at
Bissell’s Point.

DIVISION No. 1.

River tower and bridge.....	\$ 60,000
Conduit connecting river tower with pump-pits	24,000
45,000 cubic yards earth excavation, 80 cents.....	36,000
11,000 cubic yards stone masonry (at average), \$16.00.....	176,000
2,000 cubic yards concrete masonry, \$4.80.....	9,600
250,000 feet B. M. oak lumber, \$40.00.....	10,000
50 tons iron girders, \$50.00.....	2,500
45,000 cubic yards earth embankment, 36 cents.....	16,200
6,000 cubic yards rip-rap, \$1.25.....	7,500
Coffer dam.....	55,000
Buildings and chimney stack.....	70,000
Two engines and boilers, each of a capacity of 25,000,000 gallons per day, \$85,000.....	170,000
130 tons of 48-inch pipe in pump mains, \$35.00.....	4,550
Gates, valves and check-valves.....	6,500
Total	\$ 647,850

DIVISION No. 2.

Raising the walls of the present settling basins sufficient to give them a
working capacity of twenty million gallons each.

3,370 cubic yards stone masonry, \$10.00.....	\$ 33,700
150 cubic yards stone masonry, \$20.00	3,000
2,700 cubic yards clay puddle, 75 cents.....	2,025
10,000 cubic yards earth work, 45 cents.....	4,500
500 cubic yards sand filling, \$2.00.....	1,000
9,000 linear feet coping.....	9,000
Alterations in gate houses and extra work	2,500
Total	\$ 55,725

DIVISION No. 3.

Embracing the construction of two settling basins on the land adjoining Ferry Street on the south, of a capacity of thirty-five million gallons.

320,000 cubic yards earth work, 37 cents.....	\$ 118,400
85,000 cubic yards clay puddle, 80 cents.....	68,000
15,000 cubic yards concrete masonry, \$4.60.....	69,000
20,000 cubic yards stone masonry, \$6.50.....	130,000
1,200 cubic yards cut stone masonry, \$25.00.....	30,000
4,500 cubic yards brick masonry, \$8.00.....	36,000
68,000 square yards brick paving, 90 cents.....	61,200
3,200 square yards stone paving, \$1.50.....	4,800
230,000 feet B. M. pine lumber in foundations, \$23.00.....	5,290
800 cubic yards of sand filling, \$2.00.....	1,600
300 tons of 48-inch pipe, \$35.00.....	10,500
Gate house, gates, etc., etc.....	11,000

Total..... \$ 545,790

DIVISION No. 4.

Construction of five filter beds at \$250,000.00..... \$ 1,250,000

DIVISION No. 5.

Land damages; 75 acres, at \$5,500..... \$ 412,500

RECAPITULATION.

Division No. 1. River work.....	\$ 647,850
Division No. 2. Increasing capacity of present settling basins ..	55,725
Division No. 3. Additional settling basins	545,790
Division No. 4. Five filter beds.....	1,250,000
Division No. 5. Land damages.....	412,500

Total..... \$ 2,911,865

To increase the capacity of the low-service works to one hundred million gallons per day would require

AT CHAIN OF ROCKS.

Three additional pumping engines at \$85,000.....	\$ 255,000
Three additional settling basins at \$160,000.....	480,000
Construction of five additional filter beds at Bissell's Point at \$250,000.....	1,250,000
Total.....	\$ 1,985,000

Total..... \$ 1,985,000

AT BISSELL'S POINT.

Two pumping engines, \$85,000.....	\$ 170,000
Two settling basins, \$252,000.....	504,000
Five filter beds, \$250,000	1,250,000
Total.....	\$ 1,924,000

In the estimate for construction at Bissell's Point, the cost of land adjacent to the present low-service works, which would be required for the future extension to a capacity of 100,000,000 gallons, has been included, because, unless the land was secured now, the rise in value would probably become so great as to preclude any further extension at this location.

The estimate for land damages at Chain of Rocks also includes the cost of all land needed in the future extension of the works to one hundred million capacity.

To avoid the cost of purchasing additional land, plans and estimates for the extension at Bissell's Point were first made locating the basins on the ground now owned by the city, just west of the present settling basins. Owing to the distance back from the river, the bottom of the proposed basins would have to be raised some nine or ten feet above the present surface of the ground, in order to be able to drain the sediment deposited into the river.

The area of available ground at this location limited the capacity of the proposed works to forty million gallons per day.

The estimated cost of this work was so great, and the proposed construction was considered so unsafe, that the plans were abandoned as impracticable.

The location at the Chain of Rocks has the following advantages over the location at Bissell's Point:

1. It will secure for all time to come water not contaminated by sewage, as the intake will be above all influence of town drainage, shore nuisances or washings incidental to the suburbs of a city.

2. At the Chain the foundations for the machinery can be had on solid rock, while at Bissell's Point it would be some twenty-two feet above the rock. Also the ground at the Chain gives a much better foundation for the masonry of the settling basins than at Bissell's Point.

3. An estimate can be made for construction at the Chain with much more accuracy than at Bissell's Point. In the latter case the cost of construction is more liable to be largely increased by accidents.

4. The estimate for the Chain includes the cost of new machinery in place of that now in use at Bissell's Point, which (assuming that the works at the Chain may be put in operation in 1888-9) will have been in constant operation for seventeen or eighteen years.

5. The Chain of Rocks construction will enable a storage of filtered water to be made in the present basins. After the consumption reaches forty-five to fifty million gallons per day, such storage will be absolutely required. If, in addition to the estimate given for the extension at Bissell's Point, provision of this kind be added, the expense of construction would largely exceed the expense of building at the Chain of Rocks.

6. It would be practically impossible to sewer the area of the city that drains into the river above the present location of the low-service works, so that the storm water could be delivered into the river below the present intake. The sewage proper could be thus treated, but this would require a double system of sewers, the extra cost of which would be over one million dollars and a large annual expenditure for pumping.

7. The ground between Broadway and the river, for three and a half miles above Bissell's Point, being very suitable for the purpose, will undoubtedly, to a great extent, be covered with factories of one kind and another; the transportation of materials used here will be largely by river, and thus, within the next twelve or fifteen years there will probably be quite a number of river craft lying along the shore just above the place where the water for the supply of the city would be taken, should the extension be made at Bissell's Point.

8. Owing to their location, the present basins at Bissell's Point cannot be cleaned from about the middle of April to middle of September, whereby their capacity is reduced fully one-fifth. At the Chain of Rocks the elevation of the ground is such that the settling basins can be placed high enough to be cleaned at all stages of water, and the increased slope to the conduits that carry the sediment back to the river will insure the handling of the material in less time and at less expense than obtains in the present basins.

9. As shown by the estimates, the source of supply can now be changed to the Chain of Rocks without a money loss; but should extensions of the river work be made at Bissell's Point, then no change in the mode of taking the water from the river could be had without the sacrifice of the largest part of the cost of this construction.

The accompanying maps and plans are submitted with this report, viz. :

No. 1. Map of part of St. Louis County, with profiles.

No. 2 Map showing west bank of Mississippi river from Grand Avenue to the northern limits of city.

No. 3. Map showing proposed location of pumping station and settling basins at Chain of Rocks.

No. 4. Plan of pump pits and of foundations for buildings and chimney.

No. 5. Details of receiving basin.

No. 6. Plan showing proposed construction of one of the settling basins.

No. 7. Details and sections of basins and waste-well walls.

No. 8. Plan of influent weir and gate chamber for delivering the water to settling basins.

No. 9. Plans of effluent wells and conduits for delivering settled water to main conduit.

No. 10. Map showing location of proposed conduit from Bissell's Point to Chain of Rocks; also location of railroad switch.

No. 11. Profile of conduit line.

No. 12. Plan of proposed section of main conduit.

Nos. 13, 14 and 15. Plans and section of main culverts for crossing streams under conduit.

No. 16. Plan showing location of river tower, pump pits, and foundations of buildings.

No. 17. Plan showing proposed location of settling basins on the ground south of Ferry Street, and between Kennett Street and the river.

The construction of the works at the Chain can be so devised as to get a portion of it into use by the fall of 1888. By that time the conduit could be built and the engine building far enough advanced to allow of the erection of one of the pumping machines. By 1889 one of the three basins could be completed and during the following year, 1890, the entire work, except the filter beds, required to furnish fifty million gallons per day, could be put into operation.

If the financial policy, now thoroughly inaugurated, be continued, then the statement marked "A" will show in what order the work can be carried on, and when the entire extension to a capacity of fifty million gallons per day can be completed.

In making up this statement, it is believed that the minimum of income has been given, and that the maximum of operating expenses has been estimated for.

The amount allotted for the extension of the distribution pipe for the first few years, is doubtless rather limited, but considering the very large amounts that have been given to this part of the works during 1884-5, and the imperative necessity of having the capacity of the low-service work increased in the shortest time possible, has induced the Board to limit the yearly amount for laying pipes during 1886, 1887, 1888, and 1889, to the lowest amount admissible.

In conclusion, the Board desires to say, that although extensive surveys, borings, soundings, test pits and other examinations of the grounds upon which it is proposed to locate the works have been made, yet the plans herewith submitted are not proposed with a view of their being adopted, as the final plans for construction; but, rather, they are to be considered as the general plans on which to base estimates of costs, and as showing the general designs and location of the proposed construction.

The estimates are considered sufficient to cover the maximum cost in any event, and it is believed that experiments now in progress will demonstrate that the cost of construction, as regards the settling basins and filter beds, can be reduced materially below the amount estimated for this portion of the works, while in no part of the proposed construction will the estimates be exceeded.

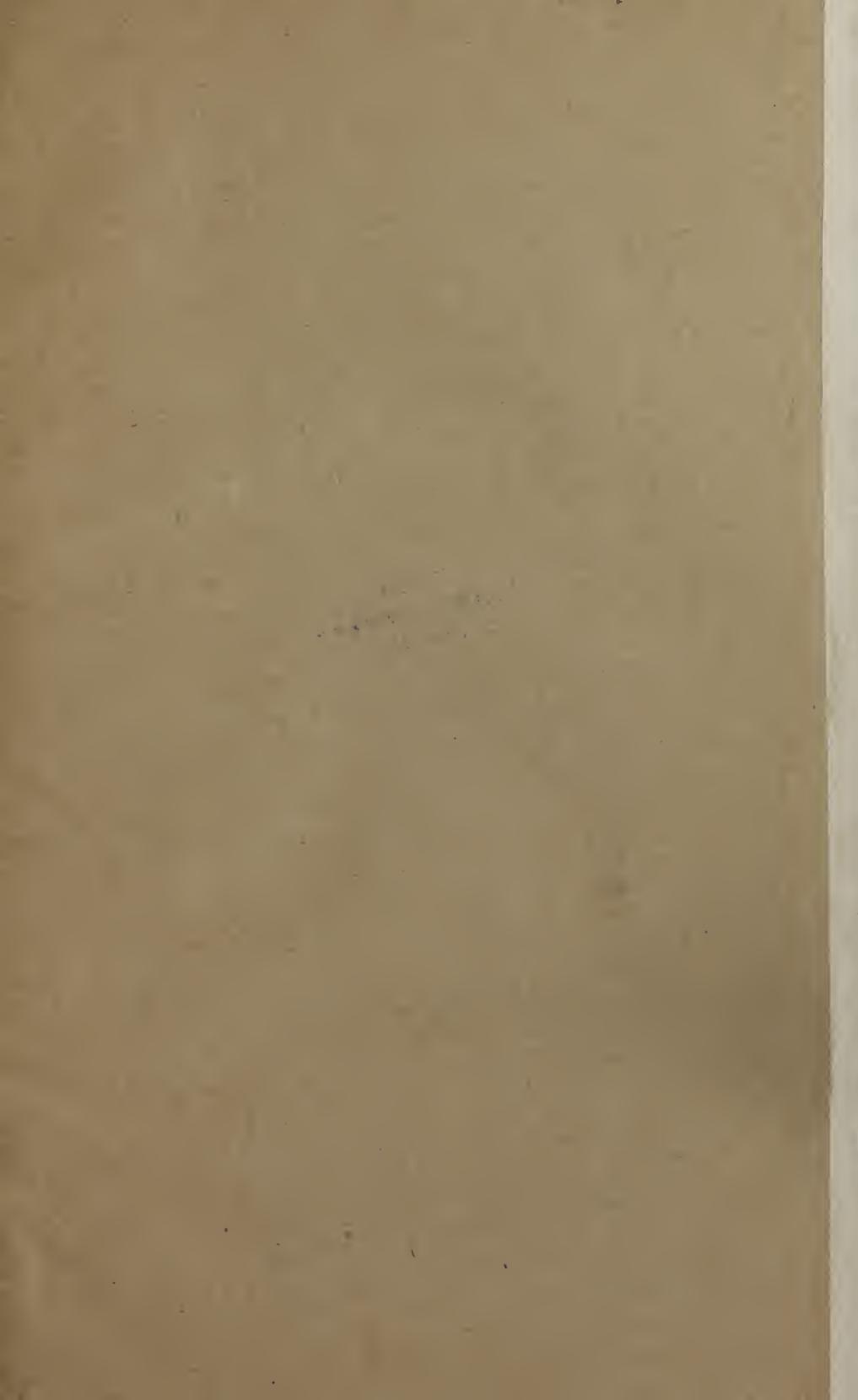
On the other hand, as has been stated above, the anticipated income from water rates has been placed at what is considered a minimum amount, while the operating expenses have been placed at what is believed to be an outside figure.

The Board would earnestly recommend to the Honorable Municipal Assembly that they take such action as will enable the construction of the low-service works at the Chain of Rocks, to be commenced during the present season.

By order of the Board,

HENRY FLAD, President.

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STATEMENT showing result if the Interest on Water Bonds, from 1885

Year.	Population.	Quantity of water used in millions and tenths.	Estimated amount of Income from Water Rates.	Operating expenses of Water Commissioner and Assessor and Col- lector of Water Rates Department.	Appropriation for lay- ing water pipe and distribution mains.	Interest on Water Bonds paid out of Interest Revenue.	Interest on Water Bonds paid out of Water Works Re- venue.	
1885..	404,000	34.2	\$ 760,000	\$ 309,000	\$ 60,000	\$ 312,000	.....
1886..	415,000	35.3	781,000	317,000	50,000	312,000	.....
1887..	426,000	36.2	817,000	326,000	55,000	312,000	.....
1888..	437,000	37.2	838,000	335,000	60,000	242,000	.....
1889..	449,000	38.2	859,000	344,000	65,000	242,000	.....
1890..	461,000	39.2	880,000	353,000	70,000	242,000	.....
1891..	473,000	40.2	902,000	363,000	75,000	233,000	.....
1892..	486,000	41.3	923,000	372,000	250,000	39,000	\$ 194,000	
1893..	499,000	42.4	945,000	407,000	125,000	.....	208,000
1894..	512,000	43.5	967,000	418,000	100,000	.....	199,800
1895..	525,000	44.6	990,000	428,000	100,000	.....	189,832
1896..	539,000	45.8	1,013,000	440,000	100,000	.....	188,745
1897..	553,000	47.0	1,036,000	451,000	100,000	.....	177,375
1898..	567,000	48.2	1,059,000	463,000	100,000	.....	165,070
1899..	582,000	49.4	1,083,000	474,000	100,000	.....	161,833
1900..	597,000	50.7	1,107,000	487,000	100,000	.....	157,946
1901..	612,000	52.0	1,131,000	499,000	100,000	.....	143,464
1902..	628,000	53.3	1,156,000	512,000	100,000	.....	134,323
1903..	644,000	54.7	1,181,000	525,000	100,000	.....	117,936
1904..	660,000	56.1	1,207,000	539,000	100,000	.....	100,413
1905..	676,000	57.5	1,232,000	552,000	100,000	.....	81,709
1906..	692,000	58.9	1,260,000	565,000	100,000	.....	61,778
1907..	709,000	60.3	1,287,000	579,000	100,000	.....	40,449
1908..	726,000	61.7	1,315,000	592,000	100,000	.....	17,747
1909..	743,000	63.2	1,343,000	607,000	100,000	.....	.....
1910..	761,000	64.7	1,372,000	621,000	100,000	.....	.....
1911..	779,000	66.2	1,401,000	636,000	100,000	.....	.....
1912..	798,000	67.8	1,430,000	651,000	100,000	.....	.....
1913..	817,000	69.4	1,460,000	666,000	100,000	.....	.....
1914..	836,000	71.1	1,490,000	683,000	100,000	.....	.....
1915..	856,000	72.8	1,520,000	700,000	100,000	.....	.....
1916..	876,000	74.5	1,550,000	718,000	100,000	.....	.....
			\$36,295,000	\$15,932,000	\$3,110,000	\$1,934,000	\$2,340,420	\$2

"A"

STATEMENT showing result if the Interest on Water Bonds, from 1882

to 1891, be paid out of Interest Revenue, and Surplus Income of Water of the Works.

Works over Operating Expenses be applied to the Extension

Year.	Population.	Quantity of water used in millions of tenths.	Estimated amount of Income from Water Rates.	Operating expenses of Water Commissioner and Assessor and Collector of Water Rates Department.	Appropriation for luxury water pipe and distribution mains.	Interest on Water Bonds paid out of Interest Revenue.	Interest on Water Bonds paid out of Water Works Revenue.
1885..	401,000	31.2	\$ 760,000	\$ 309,000	\$ 60,000	\$ 312,000	.....
1886..	415,000	35.3	781,000	317,000	50,000	312,000	.....
1887..	126,000	36.2	817,000	326,000	55,000	312,000	.....
1888..	437,000	37.2	838,000	335,000	60,000	242,000	.....
1889..	449,000	38.2	859,000	341,000	65,000	242,000	.....
1890..	461,000	39.2	880,000	353,000	70,000	242,000	.....
1891..	473,000	40.2	902,000	363,000	75,000	233,000	.....
1892..	486,000	41.3	923,000	372,000	250,000	39,000	\$ 194,000
1893..	499,000	42.4	945,000	407,000	125,000	208,000	.....
1894..	512,000	43.5	967,000	418,000	100,000	199,800	.....
1895..	525,000	44.6	990,000	428,000	100,000	189,832	.....
1896..	539,000	45.8	1,013,000	440,000	100,000	188,745	.....
1897..	553,000	47.0	1,036,000	451,000	100,000	177,375	.....
1898..	567,000	48.2	1,059,000	463,000	100,000	165,070	.....
1899..	582,000	49.4	1,083,000	474,000	100,000	161,833	.....
1900..	597,000	50.7	1,107,000	487,000	100,000	157,946	.....
1901..	612,000	52.0	1,131,000	499,000	100,000	143,464	.....
1902..	628,000	53.3	1,156,000	512,000	100,000	134,323	.....
1903..	644,000	54.7	1,181,000	525,000	100,000	117,936	.....
1904..	660,000	56.1	1,207,000	539,000	100,000	100,413	.....
1905..	676,000	57.5	1,232,000	552,000	100,000	81,709	733,709
1906..	692,000	58.9	1,260,000	565,000	100,000	61,778	726,778
1907..	709,000	60.3	1,287,000	579,000	100,000	40,449	719,449
1908..	726,000	61.7	1,315,000	592,000	100,000	17,747	709,747
1909..	743,000	63.2	1,343,000	607,000	100,000	.....	250,000
1910..	761,000	64.7	1,372,000	621,000	100,000	.....	250,000
1911..	779,000	66.2	1,401,000	636,000	100,000	.....	250,000
1912..	798,000	67.8	1,430,000	651,000	100,000	.....	250,000
1913..	817,000	69.4	1,460,000	666,000	100,000	.....	250,000
1914..	836,000	71.1	1,490,000	683,000	100,000	.....	250,000
1915..	856,000	72.8	1,520,000	700,000	100,000	.....	250,000
1916..	876,000	74.5	1,550,000	718,000	100,000	.....	250,000
			\$36,295,000	\$15,932,000	\$3,110,000	\$1,934,000	\$2,340,420

Total amount of all expenditures.	Amount that can be appropriated for extension of works.	LOW-SERVICE WORK.	HIGH-SERVICE WORK.
\$ 369,000	\$ 391,000
367,000	414,000	\$180,000
381,000	436,000	239,250	169,000
395,000	443,000	160,750	196,750
409,000	450,000	252,250	282,920
423,000	457,000	\$ 67,080
438,000	464,000	262,000
461,000	470,000	464,000
486,000	487,000	107,000
500,000	499,000	250,000
514,000	515,000	250,000
528,000	529,000	250,000
542,000	543,000	250,000
556,000	557,000	250,000
570,000	571,000	250,000
584,000	585,000	250,000
598,000	600,000	250,000
612,000	613,000	250,000
626,000	627,000	250,000
640,000	641,000	250,000
654,000	655,000	250,000
668,000	669,000	250,000
682,000	683,000	250,000
696,000	697,000	250,000
710,000	711,000	250,000
724,000	725,000	250,000
738,000	739,000	250,000
752,000	753,000	250,000
766,000	767,000	250,000
780,000	781,000	250,000
794,000	795,000	250,000
808,000	809,000	250,000
822,000	823,000	250,000
836,000	837,000	250,000
850,000	851,000	250,000
864,000	865,000	250,000
878,000	879,000	250,000
892,000	893,000	250,000
906,000	907,000	250,000
920,000	921,000	250,000
934,000	935,000	250,000
948,000	949,000	250,000
962,000	963,000	250,000
976,000	977,000	250,000
990,000	991,000	250,000
1,004,000	1,005,000	250,000
1,018,000	1,019,000	250,000
1,032,000	1,033,000	250,000
1,046,000	1,047,000	250,000
1,060,000	1,061,000	250,000
1,074,000	1,075,000	250,000
1,088,000	1,089,000	250,000
1,102,000	1,103,000	250,000
1,116,000	1,117,000	250,000
1,130,000	1,131,000	250,000
1,144,000	1,145,000	250,000
1,158,000	1,159,000	250,000
1,172,000	1,173,000	250,000
1,186,000	1,187,000	250,000
1,200,000	1,201,000	250,000
1,214,000	1,215,000	250,000
1,228,000	1,229,000	250,000
1,242,000	1,243,000	250,000
1,256,000	1,257,000	250,000
1,270,000	1,271,000	250,000
1,284,000	1,285,000	250,000
1,298,000	1,299,000	250,000
1,312,000	1,313,000	250,000
1,326,000	1,327,000	250,000
1,340,000	1,341,000	250,000
1,354,000	1,355,000	250,000
1,368,000	1,369,000	250,000
1,382,000	1,383,000	250,000
1,396,000	1,397,000	250,000
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1,424,000	1,425,000	250,000
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1,732,000	1,733,000	250,000
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1,816,000	1,817,000	250,000
1,830,000	1,831,000	250,000
1,844,000	1,845,000	250,000
1,858,000	1,859,000	250,000
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1,942,000	1,943,000	250,000
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2,628,000	2,629,000	250,000
2,642,000	2,64		

STATEMENT OF Surplus Income of Water Works be applied to the

Year.	Population.	HIGH-SERVICE WORK.	Amount of Bonded Debt.	Amount of Surplus Income to be applied to Payment of Bonds.	Surplus Income.
1885 ..	404,0	Division No. 1, High-Service En- gines.	\$5,200,000		
1886 ..	415,0		5,200,000		
1887 ..	426,0		5,200,000		
1888 ..	437,0		5,200,000		
1889 ..	449,0		5,200,000		
1890 ..	461,0		5,200,000		
1891 ..	473,0		5,200,000		
1892 ..	486,0		5,200,000		
1893 ..	499,0		5,200,000		
1894 ..	512,0		5,200,000		
1895 ..	525,0	\$ 38,000	5,200,000		
1896 ..	539,0	7,000	\$85,000		
1897 ..	553,0		5,200,000		
1898 ..	567,0		5,200,000		
1899 ..	582,0	\$155,000	10,000	5,200,000	
1900 ..	597,0		40,000	5,200,000	
1901 ..	612,0			5,200,000	
1902 ..	628,0			5,126,000	\$ 74,000
1903 ..	644,0			4,947,040	178,960
1904 ..	660,0			4,610,922	336,118
1905 ..	676,0			4,247,359	363,563
1906 ..	692,0			3,847,253	400,106
1907 ..	709,0			3,416,143	431,110
1908 ..	726,0			2,954,789	461,354
1909 ..	743,0			2,534,980	419,809
1910 ..	761,0			2,010,379	524,601
1911 ..	779,0	155,000		1,604,794	405,585
1912 ..	798,0		30,000	1,043,985	560,809
1913 ..	817,0			416,744	627,241
1914 ..	836,0				416,744 \$ 587
1915 ..	856,0				602,000
1916 ..	876,0				550,000
					722,000
	0	\$310,000	\$125,000	\$85,000	\$5,200,000
					\$1,874,587

"B"

STATEMENT showing result if the Interest on Water Bonds from 1885 to 1891 be paid out of Water Works Revenue, and the Surplus Income of Water Works be applied to the Extension of the Works.

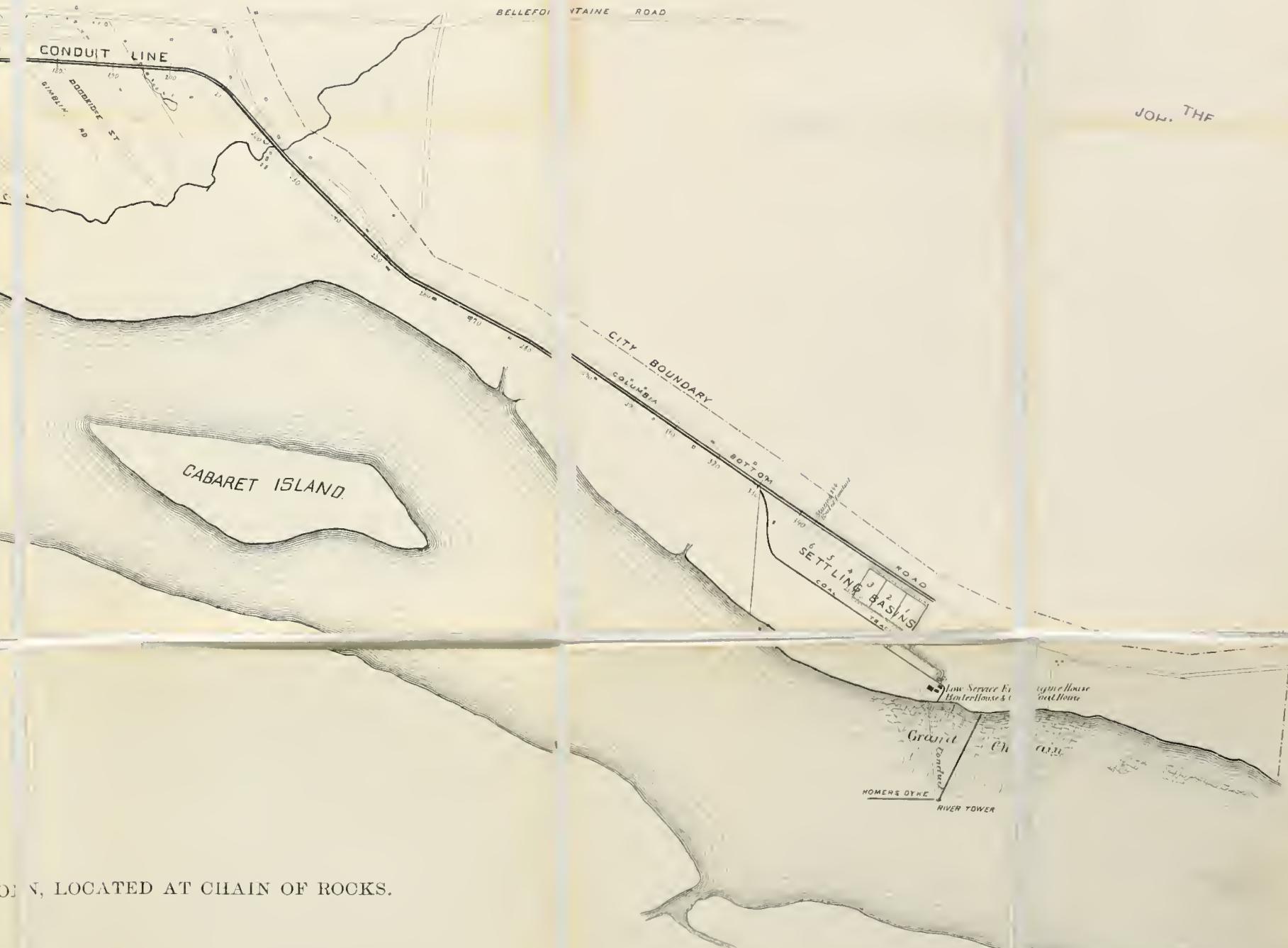
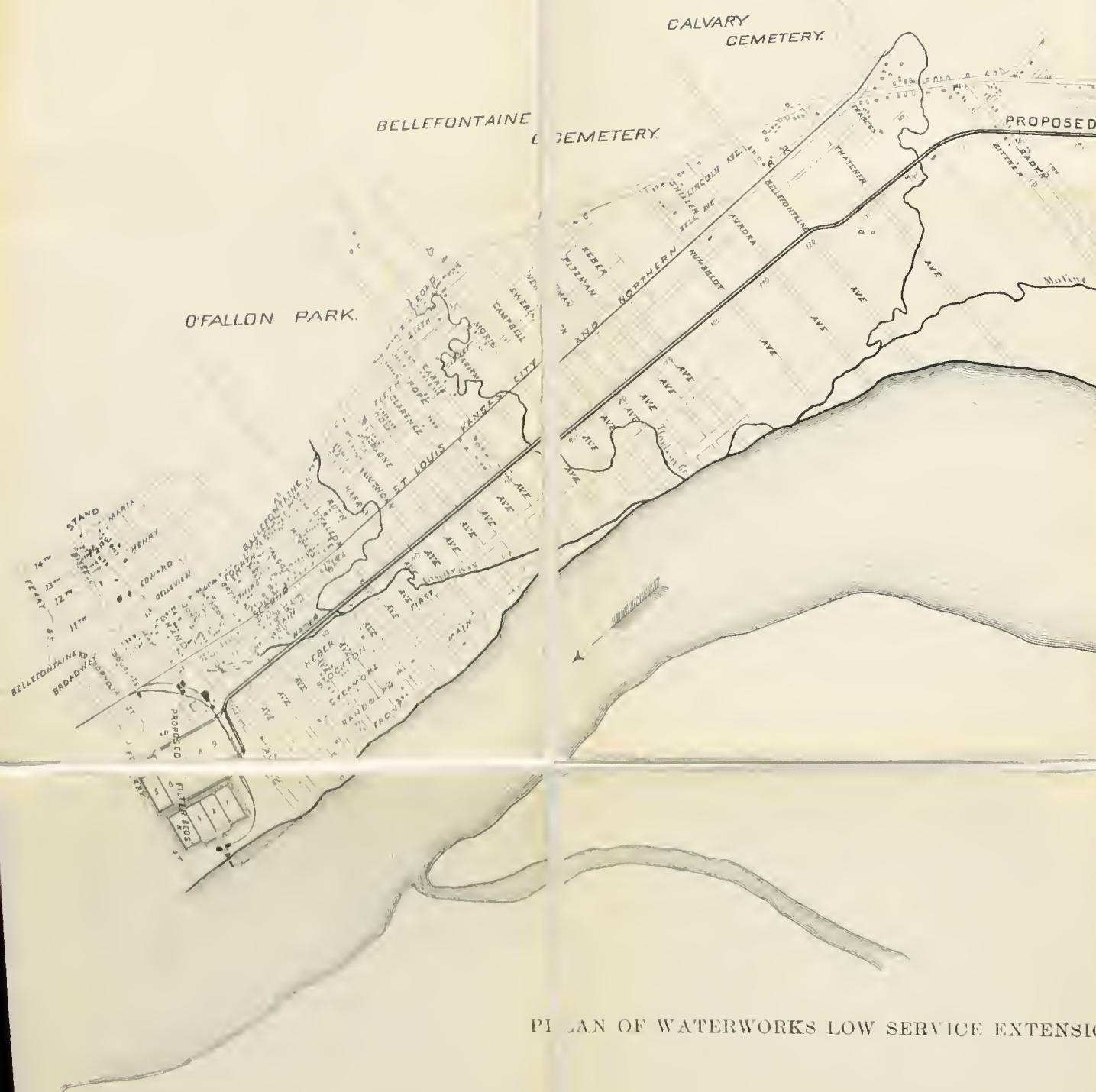
Year.	Population.	Quantity of water used, in millions and tenths.	Estimated amount of income from Water Rates.	Operating expenses of Water Commissioner and Assessor and Collector of Water Rates Department.	Appropriation for laying Water Pipe and Distribution Mains.	Interest on Water Bonds, paid out of Water Works Revenue.	Total Amount of all Expenditures.
1885..	404,000	34.2	\$ 760,000	\$ 309,000	\$ 60,000	\$ 312,000	\$ 681,000
1886..	415,000	35.3	781,000	317,000	50,000	312,000	679,000
1887..	426,000	36.2	817,000	326,000	55,000	312,000	693,000
1888..	437,000	37.2	838,000	335,000	60,000	242,000	637,000
1889..	449,000	38.2	859,000	344,000	65,000	242,000	651,000
1890..	461,000	39.2	880,000	353,000	70,000	242,000	665,000
1891..	473,000	40.2	902,000	363,000	75,000	233,000	671,000
1892..	486,000	41.3	923,000	372,000	75,000	233,000	680,000
1893..	499,000	42.4	945,000	382,000	75,000	208,000	665,000
1894..	512,000	43.5	967,000	392,000	75,000	205,000	675,000
1895..	525,000	44.6	990,000	401,000	75,000	205,000	684,000
1896..	539,000	45.8	1,013,000	412,000	75,000	208,000	695,000
1897..	553,000	47.0	1,036,000	423,000	75,000	208,000	706,000
1898..	567,000	48.2	1,059,000	463,000	185,000	208,000	856,000
1899..	582,000	49.4	1,083,000	474,000	116,000	208,000	798,000
1900..	597,000	50.7	1,107,000	487,000	162,000	208,000	857,000
1901..	612,000	52.0	1,131,000	499,000	100,000	208,000	807,000
1902..	628,000	53.3	1,156,000	512,000	100,000	205,040	817,040
1903..	644,000	54.7	1,181,000	525,000	122,000	197,882	844,882
1904..	660,000	56.1	1,207,000	539,000	120,000	184,437	843,437
1905..	676,000	57.5	1,232,000	552,000	110,000	169,894	831,894
1906..	692,000	58.9	1,260,000	565,000	110,000	153,890	828,890
1907..	709,000	60.3	1,287,000	579,000	110,000	136,646	825,646
1908..	726,000	61.7	1,315,000	592,000	110,000	118,191	820,191
1909..	743,000	63.2	1,343,000	607,000	110,000	101,399	818,399
1910..	761,000	64.7	1,372,000	621,000	110,000	80,415	811,415
1911..	779,000	66.2	1,401,000	636,000	110,000	64,191	810,191
1912..	798,000	67.8	1,430,000	651,000	110,000	41,739	803,759
1913..	817,000	69.4	1,460,000	666,000	110,000	16,669	792,669
1914..	836,000	71.1	1,490,000	683,000	110,000	.....	793,000
1915..	856,000	72.8	1,520,000	700,000	110,000	.....	810,000
1916..	876,000	74.5	1,550,000	718,000	110,000	.....	828,000
			\$36,295,000	\$15,798,000	\$3,110,000	\$5,470,413	\$24,378,413

385 to 1891 be paid out of Water Works Revenue, and the Surplus Income of Water Works be applied to the Extension of the Works.

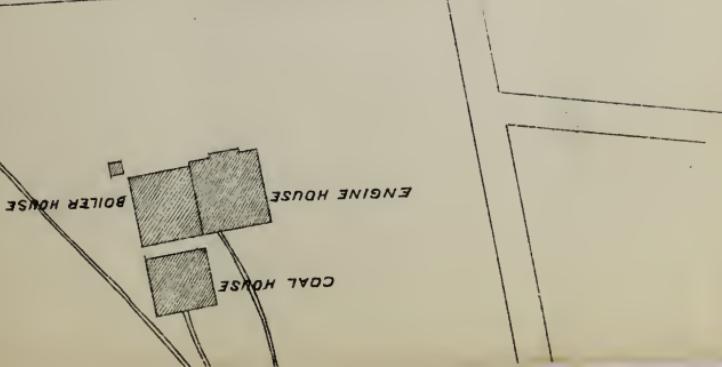
Year.	Population.	Quantity of water used, in millions and tenths.	Estimated amount of income from Water Rates.	Operating expenses of Water Commissioner and Assessor and Collector of Water Rates Department.	Appropriation for laying Water Pipe and Distribution Mains.	Interest on Water Bonds, paid out of Water Works Revenue.	Total Amount of all Expenditures.	LOW-SERVICE WORK.				HIGH-SERVICE WORK.				Amount of Bonded Debt.	Amount of Surplus Income to be applied to payment of Bonds.	Surplus Income.	
								Amount that can be Appropriated for Extension of Works.	Division No. 1. River Work.	Division No. 2. Settling Basins.	Division No. 3. Conduit.	Division No. 4. Filters.	Division No. 5. Land Damages.	Division No. 1. High-Service Engines.	Division No. 2. Pump Mains, Nos. 5 and 6.	Division No. 3. High-Service Engine House.			
1885..	404,000	34.2	\$ 760,000	\$ 309,000	\$ 60,000	\$ 312,000	\$ 681,000	\$ 79,000	.....	.....	.....	.....	.....	.....	.....	.....	\$ 5,200,000	.....	.....
1886..	415,000	35.3	781,000	317,000	50,000	312,000	679,000	102,000	\$ 181,000	.....	.....	.....	.....	.....	.....	.....	5,200,000	.....	.....
1887..	426,000	36.2	817,000	326,000	55,000	312,000	693,000	124,000	124,000	.....	.....	.....	.....	.....	.....	.....	5,200,000	.....	.....
1888..	437,000	37.2	838,000	335,000	60,000	242,000	637,000	201,000	201,000	100,000	.....	.....	.....	.....	.....	.....	5,200,000	.....	.....
1889..	449,000	38.2	859,000	344,000	65,000	242,000	651,000	208,000	208,000	\$ 105,000	100,000	.....	.....	.....	.....	.....	5,200,000	.....	.....
1890..	461,000	39.2	880,000	353,000	70,000	242,000	665,000	215,000	215,000	115,000	100,000	.....	.....	.....	.....	.....	5,200,000	.....	.....
1891..	473,000	40.2	902,000	363,000	75,000	233,000	671,000	231,000	231,000	115,250	115,750	.....	.....	.....	.....	.....	5,200,000	.....	.....
1892..	486,000	41.3	923,000	372,000	75,000	233,000	680,000	243,000	243,000	241,750	\$ 1,250	.....	.....	.....	.....	.....	5,200,000	.....	.....
1893..	499,000	42.4	945,000	382,000	75,000	208,000	665,000	280,000	280,000	280,000	280,000	.....	.....	.....	.....	.....	5,200,000	.....	.....
1894..	512,000	43.5	967,000	392,000	75,000	205,000	675,000	292,000	292,000	254,000	254,000	.....	.....	.....	.....	.....	5,200,000	.....	.....
1895..	525,000	44.6	990,000	401,000	75,000	205,000	684,000	306,000	306,000	214,000	214,000	.....	.....	.....	.....	.....	5,200,000	.....	.....
1896..	539,000	45.8	1,013,000	412,000	75,000	208,000	695,000	318,000	318,000	318,000	318,000	.....	.....	.....	.....	.....	5,200,000	.....	.....
1897..	553,000	47.0	1,036,000	423,000	75,000	208,000	706,000	330,000	330,000	330,000	330,000	.....	.....	.....	.....	.....	5,200,000	.....	.....
1898..	567,000	48.2	1,059,000	463,000	185,000	208,000	856,000	203,000	203,000	203,000	203,000	.....	.....	.....	.....	.....	5,200,000	.....	.....
1899..	582,000	49.4	1,083,000	474,000	116,000	208,000	798,000	285,000	285,000	85,000	160,000	.....	.....	.....	.....	.....	5,200,000	.....	.....
1900..	597,000	50.7	1,107,000	487,000	162,000	208,000	857,000	250,000	250,000	250,000	250,000	.....	.....	.....	.....	.....	5,200,000	.....	.....
1901..	612,000	52.0	1,131,000	499,000	100,000	208,000	807,000	324,000	324,000	324,000	324,000	.....	.....	.....	.....	.....	5,200,000	.....	.....
1902..	628,000	53.3	1,156,000	512,000	100,000	205,040	817,040	338,960	338,960	160,000	160,000	.....	.....	.....	.....	.....	5,200,000	.....	.....
1903..	644,000	54.7	1,181,000	525,000	122,000	197,882	844,882	336,118	336,118	.....	.....	.....	.....	.....	.....	.....	5,200,000	.....	.....
1904..	660,000	56.1	1,207,000	539,000	120,000	184,437	843,437	363,563	363,563	.....	.....	.....	.....	.....	.....	.....	5,200,000	.....	.....
1905..	676,000	57.5	1,232,000	552,000	110,000	169,894	831,894	400,106	400,106	.....	.....	.....	.....	.....	.....	.....	5,200,000	.....	.....
1906..	692,000	58.9	1,260,000	565,000	110,000	153,890	828,890	431,110	431,110	.....	.....	.....	.....	.....	.....	.....	5,200,000	.....	.....
1907..	709,000	60.3	1,287,000	579,000	110,000	136,646	825,646	461,354	461,354	.....	.....	.....	.....	.....	.....	.....	5,200,000	.....	.....
1908..	726,000	61.7	1,315,000	592,000	110,000	118,191	820,191	494,809	494,809	75,000	75,000	.....	.....	.....	.....	.....	5,200,000	.....	.....
1909..	743,000	63.2	1,343,000	607,000	110,000	101,399	818,399	524,601	524,601	.....	.....	.....	.....	.....	.....	.....	5,200,000	.....	.....
1910..	761,000	64.7	1,372,000	621,000	110,000	80,415	811,415	560,585	560,585	155,000	155,000	.....	.....	.....	.....	.....	5,200,000	.....	.....
1911..	779,000	66.2	1,401,000	636,000	110,000	64,191	810,191	590,809	590,809	30,000	30,000	.....	.....	.....	.....	.....	5,200,000	.....	.....
1912..	798,000	67.8	1,430,000	651,000	110,000	41,739	803,759	627,241	627,241	.....	.....	.....	.....	.....	.....	.....	5,200,000	.....	.....
1913..	817,000	69.4	1,460,000	666,000	110,000	16,669	792,669	667,331	667,331	250,000	250,000	.....	.....	.....	.....	.....	5,200,000	.....	.....
1914..	836,000	71.1	1,490,000	683,000	110,000	.....	793,000	95,000	95,000	.....	.....	250,000	250,000	.....	.....	.....	5,200,000	.....	.....
1915..	856,000	72.8	1,520,000	700,000	110,000	.....	810,000	160,000	160,000	160,000	160,000	.....	.....	.....	.....	.....	5,200,000	.....	.....
1916..	876,000	74.5	1,550,000	718,000	110,000	.....	828,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	5,200,000	.....	.....
			\$36,295,000	\$15,798,000	\$3,110,000	\$5,470,413	\$24,378,413	\$4,842,000	\$835,000	\$85,250	\$756,750	\$1,650,000	\$65,000	0	\$310,000	\$125,000	\$85,000	\$5,200,000	\$1,874,587

SCOTT'S
LITERATURE

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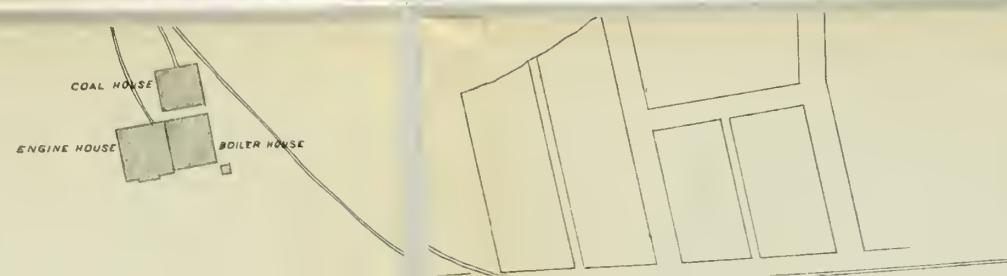
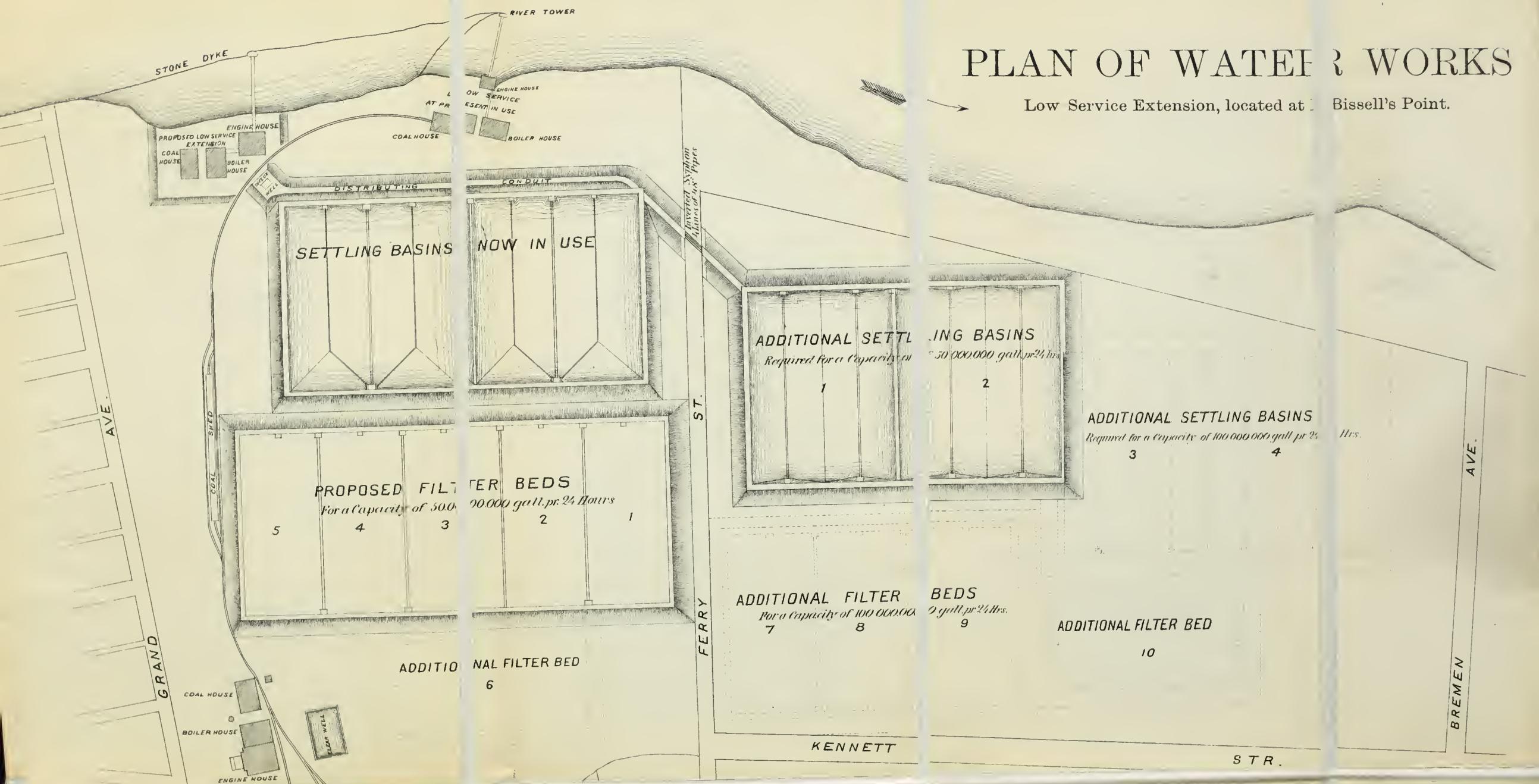


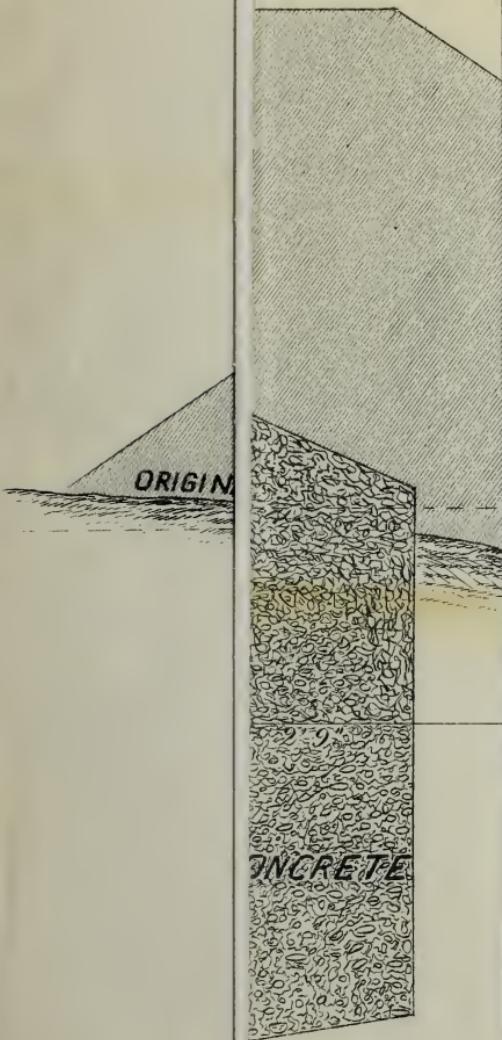
PI LAN OF WATERWORKS LOW SERVICE EXTENSION, LOCATED AT CHAIN OF ROCK



PLAN OF WATER WORKS

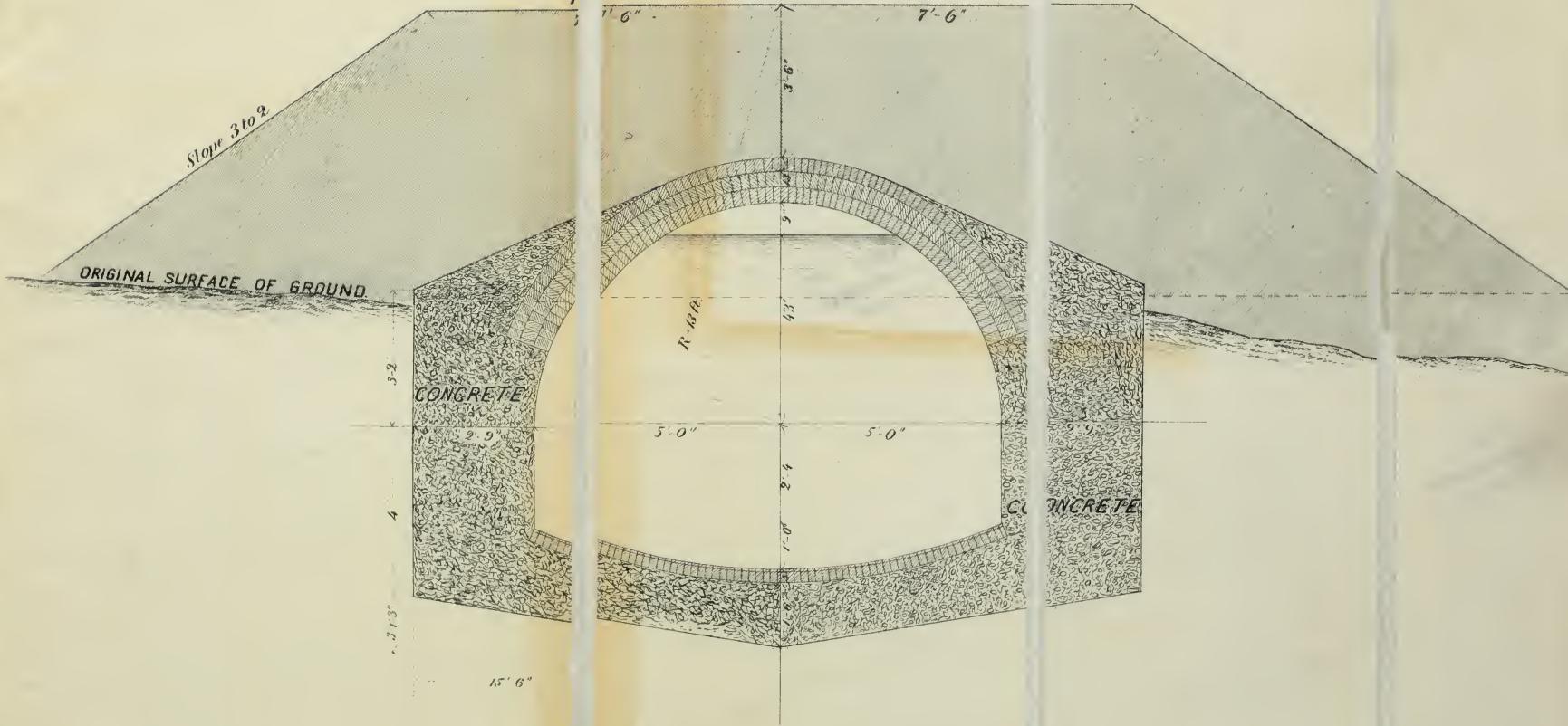
Low Service Extension, located at Bissell's Point.





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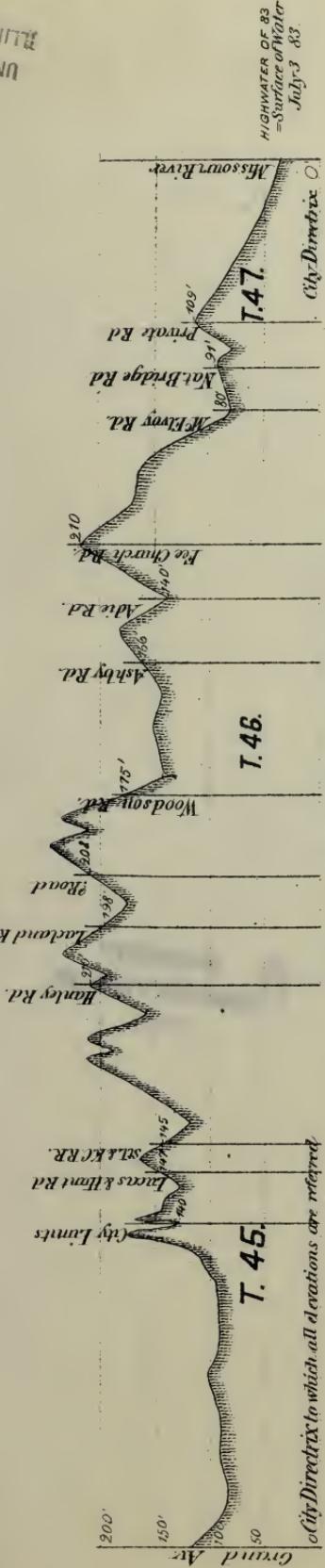


SECTION OF CONDUIT FOR CARRYING WATER FROM SETTLING BASINS AT CHAIN OF ROCKS TO FILTER BEDS AT BISSELL'S POINT.

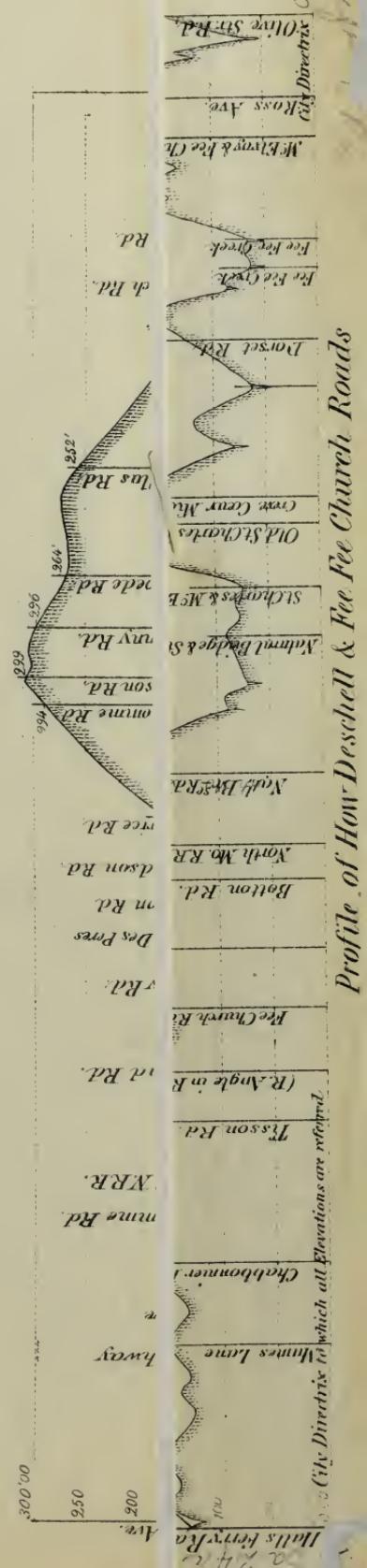
ST. LOUIS CITY WATER WORKS EXTENSION.

PROFILES, SHOWING ELEVATIONS.

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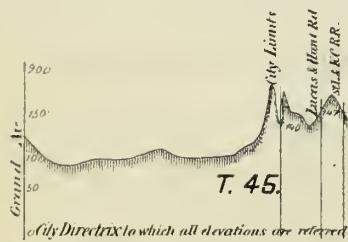
Profile of St. Charles Rock Road



Profile of Hourly Deschell & Fee Fee Church Roads

ST. LOUIS CITY WATER WORKS EXTENSION.

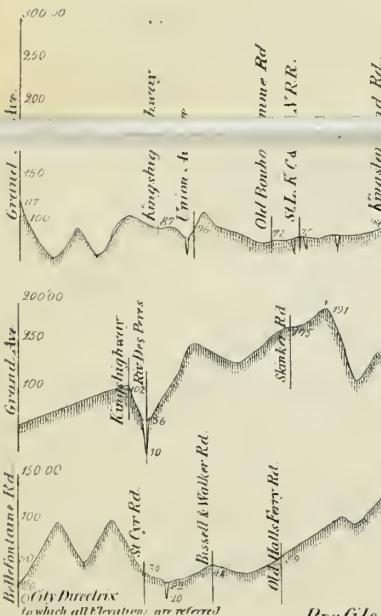
PROFILES SHOWING ELEVATIONS.



T. 45.

Profile of St. Charles Rock Road

HIGHWATER OF '83
= Surface of Water
July 3 '83



Profile of Olive Street Road

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Profile of Clayton & Conway Rds.

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Profile of Robbins Mill Road

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Year	Estimated Population	Maximum Consumption Millions of Gallons per Day
1885	404,000	34.2
1886	415,000	35.3
1887	425,000	36.2
1888	437,000	37.2
1889	449,000	38.2
1890	461,000	39.2
1891	473,000	40.2
1892	486,000	41.3
1893	499,000	42.4
1894	512,000	43.5
1895	525,000	44.6
1896	539,000	45.8
1897	553,000	47.0
1898	567,000	48.2
1899	582,000	49.4
1900	597,000	51.7
1901	612,000	52.0
1902	628,000	53.3
1903	644,000	54.7
1904	660,000	56.1
1905	676,000	57.5
1906	692,000	58.9
1907	709,000	60.3
1908	726,000	61.7
1909	743,000	63.2

Diagram No. I

Showing estimated Income & Expenditures

in extending & operating the

St Louis Waterworks

from 1885 to 1916

EXPLANATION

- Operating
- Waterpipe
- New Work
- Interest
- Purchase of Bonds
- Surplus

\$1,600,000
Interest on Waterbonds paid from Interest Revenue until 1891

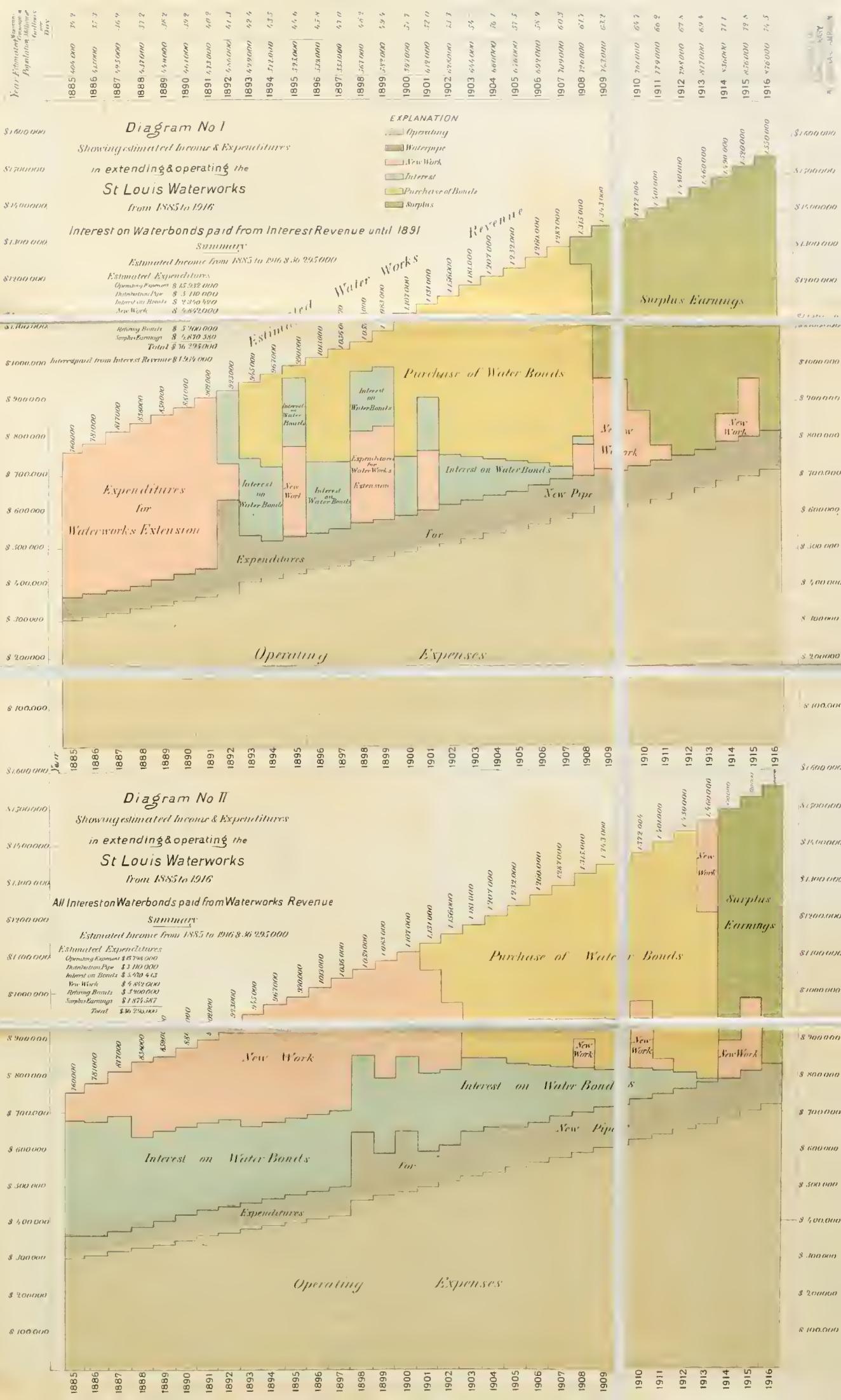
Summary

Estimated Income from 1885 to 1916 \$ 36,295,000

\$1,200,000
Estimated Expenditures

Operating Expenses \$ 15,932,000
Distribution Pipe \$ 3,110,000
Interest on Bonds \$ 2,390,420
New Work \$ 4,849,000



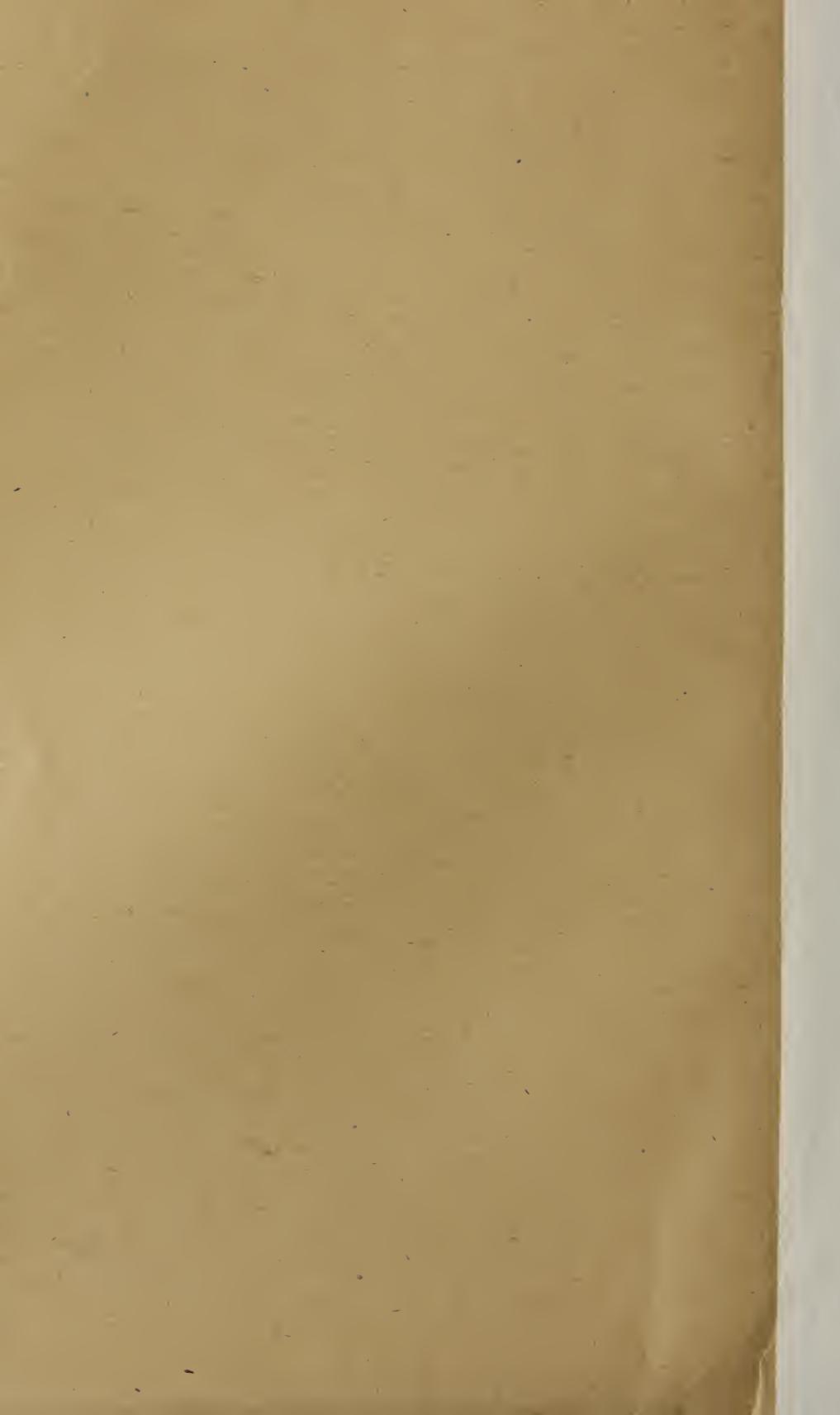




M A P

Showing Northeastern Portion of
ST. LOUIS COUNTY.







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352.6 SA24R C001
Report of the Board of Public Improvemen



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